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OLIFF & BERRIDGE, PLC P.O. BOX 320850 ALEXANDRIA, VA 22320-4850			EXAMINER SUGENT, JAMES F	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/750,256

Applicant(s)

O'CONNOR ET AL.

Examiner

James F. Sugent

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6-15, 17-21, 23-33 and 35-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-15, 17-21, 23-33 and 35-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is sent in response to Applicant's Communication received December 21, 2006 and In-Person Interview conducted March 1, 2007 for application number 10/750,256.

5 The Office hereby acknowledges receipt of the following and placed of record in file: amended Claims 1-42 (wherein claims 5, 16, 22 and 34 are canceled) are presented for examination.

Claim Rejections - 35 USC § 103

10 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

15 (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 6-15, 17-21, 23-30 and 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bose et al. (U.S. Patent Publication No. 2004/0221185 A1) (hereinafter referred to as Bose) in view of Luick (U.S. Patent No. 7,174,469 B2) (hereinafter referred to as Luick).

As to claim 1, Bose discloses a method comprising: initiating a power increase for a potentially needed functional unit to an operable power level (Bose discloses a signal [134] sent from a unit-level activity prediction logic [130] to target execution units [118, 120, 122, et al.] to change from a "sleep" or "power-down" state to a "wake up" state; paragraph 37, lines 20-28 and paragraph 38), if the potentially needed functional unit has a present power level that is

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lower than the operable power level, wherein the potentially needed functional unit is identified based on a determination of whether the potentially needed functional unit is operable to execute at least one software instruction stored within an instruction cache (Bose discloses “an instruction cache (ICACHE) 102, an instruction fetch address register (IFAR) 104, an instruction
5 buffer (IBUF) 106, multiplexor 108, branch history table and branch target buffer logic BHT/BTB 110, a branch unit 112, an instruction decode-dispatch unit IDU 114 and an issue queue 116 form a typical instruction unit (I-Unit)” wherein said instruction cache is the “instruction unit” and hereinafter referred to as “IUNIT”; paragraph 37) (Bose discloses the prediction logic [130] determining if execution units are needed; paragraph 40, line 1 thru
10 paragraph 41, line 5); fetching a line of one or more software instructions into the instruction cache (Bose discloses machine instructions being fetched from an instruction cache but said instructions are inherently fetched from system memory into the instruction cache of a processor and essentially made accessible to processing engine 130 for prediction/evaluation for power management; paragraph 39, lines 1-24); generating an information vector (132) for the line,
15 wherein the information vector identifies a set of functional units that are operable to execute the one or more software instructions (paragraph 42); and identifying the potentially needed functional unit based on the information vector (with request signals 134; paragraph 40).

Bose fails to explicitly disclose the information vector being generated *before or as the line is fetched into the instruction cache*.

20 Luick teaches a processor power management system and method wherein instructions are evaluated in a predecoder (115) before fetching instructions into an instruction cache (130) (column 2, lines 18-26 and column 4, line 57 thru column 5, line 26). Luick teaches the added

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benefit of having additional features that would further conserve power to the system (column 1, lines 63-67).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose and Luick at the time the invention was made, to modify method of Bose to include
5 evaluating the instructions before or as the before or as the line is fetched into the instruction cache as taught by Luick. One of ordinary skill in the art would be motivated to make this combination to evaluate the instructions and generate the instruction vector before or as the line is fetched into the instruction cache in view of the teachings of Luick, as doing so would give the added benefit of having additional features that would further conserve power to the system (as
10 taught by Luick above).

As to claim 2, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method further comprising: fetching one or more software instructions into the instruction cache engine (Bose discloses machine instructions being fetched from an instruction cache 102 but said instructions are inherently fetched from system memory
15 into the instruction cache of a processor and essentially made accessible to a processing engine 130 for prediction/evaluation for power management; paragraph 39, lines 1-24).

As to claim 3, Bose in combination with Luick taught the method in claim 2, as shown above. Bose further teaches the method wherein fetching the one or more instructions comprises fetching the one or more instructions into a conventional cache (paragraph 37).

20 As to claim 4, Bose in combination with Luick taught the method in claim 2, as shown above. Bose further teaches the method wherein fetching the one or more instructions comprises fetching the one or more instructions into a trace cache (paragraphs 37 and 39).

As to claim 6, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method further comprising: indicating (signaling) power status information (via signal 134) for a set of functional units (paragraph 40), wherein the power status information indicates whether a functional unit, within the set of functional units, has a present
5 power level that places the functional unit in an operable power state or a low power state (paragraph 40, line 1 thru paragraph 41, line 5).

As to claim 7, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method further comprising: incrementing a use counter (168) for a functional unit when a software instruction is fetched into the instruction cache, and when the
10 functional unit is operable to execute at least part of the software instruction (paragraphs 46 and 51).

As to claim 8, Bose in combination with Luick taught the method in claim 7, as shown above. Bose further teaches the method further comprising: decrementing the use counter (168) for the functional unit when the software instruction is eliminated from the instruction cache
15 (paragraph 46 and 50).

As to claim 9, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method further comprising: selecting one or more selected lines of software instructions stored within the cache (paragraph 39, lines 1-3); and identifying (predicting) the potentially needed functional unit as a functional unit that is operable to execute
20 at least one software instruction stored within the one or more selected lines (paragraph 39, lines 3-24 and paragraph 40, line 1 thru paragraph 41, line 5).

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As to claim 10, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method further comprising: activating (fetching and processing) a line of software instructions stored within the cache (paragraph 39, lines 1-24); and identifying (predicting) the potentially needed functional unit as a functional unit that is operable to execute
5 at least one software instruction stored within the line (paragraph 40, line 1 thru paragraph 41, line 5).

As to claim 11, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method further comprising: identifying (predicting) an unneeded functional unit as a functional unit that is not operable to execute the at least one software
10 instruction (paragraph 40, line 1 thru paragraph 41, line 5); and initiating (signaling via signal 134) a power decrease for the unneeded functional unit, if the unneeded functional unit has a second present power level that is greater than or equal to a second operable power level (paragraphs 39-40 and paragraph 40, line 1 thru paragraph 41, line 5).

As to claim 12, Bose in combination with Luick taught the method in claim 1, as shown
15 above. Bose further teaches the method wherein initiating the power decrease comprises: initiating (signaling via signal 134) the power decrease for the unneeded functional unit after execution is complete of any in-flight instructions (branched) that use the unneeded functional unit (paragraph 37, lines 20-28 and paragraph 42).

As to claim 13, Bose in combination with Luick taught the method in claim 1, as shown
20 above. Bose further teaches the method wherein initiating the power increase comprises: initiating (signaling via signal 134) the power increase for a functional unit selected from a group of functional units that includes one or more floating-point units, multipliers, dividers, shifters,

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digital signal processors, co-processors, application specific integrated circuits, data processing engines, debug logic blocks, encryption units and key-generation units (paragraph 37).

As to claim 14, Bose in combination with Luick taught the method in claim 1, as shown above. Bose further teaches the method wherein initiating the power increase comprises:

5 determining a selected operable power level from one of multiple operable power levels (“sleep,” “power-down” or “wake up”), wherein the selected operable power level is selected based on an expected result latency; and initiating the power increase to the selected operable power level (paragraphs 28 and 42).

As to claim 15, Bose discloses a method comprising: fetching one or more lines of
10 software instructions into an instruction cache (IUNIT), which is accessible to a processing engine (130) (Bose discloses “an instruction cache (ICACHE) 102, an instruction fetch address register (IFAR) 104, an instruction buffer (IBUF) 106, multiplexor 108, branch history table and branch target buffer logic BHT/BTB 110, a branch unit 112, an instruction decode-dispatch unit IDU 114 and an issue queue 116 form a typical instruction unit (I-Unit)” wherein said instruction
15 cache is the “instruction unit” and hereinafter referred to as “IUNIT”; paragraph 37) (Bose discloses machine instructions being fetched from an instruction cache but said instructions are inherently fetched from system memory into the instruction cache of a processor and essentially made accessible to a processing engine 130 for prediction/evaluation for power management; paragraph 39, lines 1-24); generating and storing (concatenated from the instruction fetch
20 address register IFAR field) an information vector (132) for selected ones of the one or more lines, wherein the information vector identifies a set of functional units that are operable to execute software instructions within a line; identifying the potentially needed functional unit is

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performed based on the information vector (Bose discloses the prediction logic [130] determining if execution units are needed; paragraph 40, line 1 thru paragraph 41, line 5 and paragraph 42), wherein a functional unit includes a portion of hardware (118, 120, 122, et al.), which is operable to perform a function in response to special instructions received from the processing engine (paragraph 39, lines 17-24); identifying (predicting) unneeded functional units as functional units that are not operable to execute a software instruction stored within the instruction cache (paragraph 41, lines 1-8 and paragraph 42); initiating a power increase ("wake up" signal via signal 134 from the prediction unit 130) for selected ones of the potentially needed functional units that are in a low power state (paragraph 37, lines 20-28); and initiating a power decrease ("sleep" or "power-down" signal via signal 134 from the prediction unit 130) for selected ones of the unneeded functional units that are in an operable power state (paragraph 37, lines 20-28).

Bose fails to explicitly disclose the information vector being generated *before or as the line is fetched into the instruction cache*.

Luick teaches a processor power management system and method wherein instructions are evaluated in a predecoder (115) before fetching instructions into an instruction cache (130) (column 2, lines 18-26 and column 4, line 57 thru column 5, line 26). Luick teaches the added benefit of having additional features that would further conserve power to the system (column 1, lines 63-67).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose and Luick at the time the invention was made, to modify method of Bose to include evaluating the instructions before or as the before or as the line is fetched into the instruction

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cache as taught by Luick. One of ordinary skill in the art would be motivated to make this combination to evaluate the instructions and generate the instruction vector before or as the line is fetched into the instruction cache in view of the teachings of Luick, as doing so would give the added benefit of having additional features that would further conserve power to the system (as
5 taught by Luick above).

As to claim 17, Bose in combination with Luick taught the method in claim 15, as shown above. Bose further teaches the method wherein fetching the one or more instructions comprises fetching the one or more instructions into a conventional cache (paragraph 37).

10 As to claim 18, Bose in combination with Luick taught the method in claim 15, as shown above. Bose further teaches the method wherein fetching the one or more instructions comprises fetching the one or more instructions into a trace cache (paragraphs 37 and 39).

As to claim 19, Bose in combination with Luick taught the method in claim 15, as shown above. Bose further teaches the method wherein initiating the power increase comprises:
initiating (signaling via signal 134) the power increase for a functional unit selected from a group
15 of functional units that includes one or more floating-point units, multipliers, dividers, shifters, digital signal processors, co-processors, application specific integrated circuits, data processing engines, debug logic blocks, encryption units and key-generation units (paragraph 37).

As to claim 20, Bose in combination with Luick taught the method in claim 15, as shown above. Bose further teaches the method wherein initiating the power increase comprises:
20 determining a selected operable power level from one of multiple operable power levels ("sleep," "power-down" or "wake up"), wherein the selected operable power level is selected based on an

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expected result latency; and initiating the power increase to the selected operable power level (paragraphs 28 and 42).

As to claim 21, Bose discloses a computer-readable medium having program instructions stored thereon to perform a method, which when executed within an electronic system, results in:

5 identifying (predicting) a potentially needed functional unit as a functional unit that is operable to execute at least one software instruction stored within an instruction cache (Bose discloses “an instruction cache (ICACHE) 102, an instruction fetch address register (IFAR) 104, an instruction buffer (IBUF) 106, multiplexor 108, branch history table and branch target buffer logic BHT/BTB 110, a branch unit 112, an instruction decode-dispatch unit IDU 114 and an issue

10 queue 116 form a typical instruction unit (I-Unit)” wherein said instruction cache is the “instruction unit” and hereinafter referred to as “IUNIT”; paragraph 37) (Bose discloses the prediction logic [130] determining if execution units are needed; paragraph 40, line 1 thru paragraph 41, line 5 and paragraph 42); fetching a line of one or more software instructions into the instruction cache (Bose discloses machine instructions being fetched from an instruction

15 cache 102 but said instructions are inherently fetched from system memory into the instruction cache of a processor and essentially made accessible to a processing engine 130 for prediction/evaluation for power management; paragraph 39, lines 1-24); generating and storing (concatenated from the instruction fetch address register IFAR field) an information vector (132) for the line, wherein the information vector identifies a set of functional units that are operable to

20 execute the one or more software instructions; and wherein identifying the potentially needed functional unit is performed based on the information vector (paragraph 42); initiating a power increase (“wake up” signal via signal 134 from the prediction unit 130) for the potentially needed

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functional unit (118, 120, 122, et al.), if the potentially needed functional unit has a present power level that is lower than an operable power level (paragraph 37, lines 20-28 and paragraph 40, line 1 thru paragraph 41, line 5).

Bose fails to explicitly disclose the information vector being generated *before or as the*
5 *line is fetched into the instruction cache.*

Luick teaches a processor power management system and method wherein instructions are evaluated in a predecoder (115) before fetching instructions into an instruction cache (130) (column 2, lines 18-26 and column 4, line 57 thru column 5, line 26). Luick teaches the added benefit of having additional features that would further conserve power to the system (column 1,
10 lines 63-67).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose and Luick at the time the invention was made, to modify medium of Bose to include evaluating the instructions before or as the before or as the line is fetched into the instruction cache as taught by Luick. One of ordinary skill in the art would be motivated to make this
15 combination to evaluate the instructions and generate the instruction vector before or as the line is fetched into the instruction cache in view of the teachings of Luick, as doing so would give the added benefit of having additional features that would further conserve power to the system (as taught by Luick above).

As to claim 23, Bose in combination with Luick taught the medium in claim 21, as shown
20 above. Bose further teaches the computer-readable medium wherein executing the program instructions further results in: selecting one or more selected lines of software instructions stored within the cache (paragraph 39, lines 1-3); and wherein identifying (predicting) the potentially

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needed functional unit includes identifying the potentially needed functional unit as a functional unit that is operable to execute at least one software instruction stored within the one or more selected lines (paragraph 39, lines 3-24 and paragraph 40, line 1 thru paragraph 41, line 5).

As to claim 24, Bose in combination with Luick taught the medium in claim 21, as
5 shown above. Bose further teaches the computer-readable medium wherein executing the program instructions further results in: identifying (predicting) an unneeded functional unit as a functional unit that is not operable to execute the at least one software instruction (paragraph 40, line 1 thru paragraph 41, line 5); and initiating (signaling via signal 134) a power decrease for the unneeded functional unit, if the unneeded functional unit has a second present power level that is
10 greater than or equal to a second operable power level (paragraphs 39-40 and paragraph 40, line 1 thru paragraph 41, line 5).

As to claim 25, Bose in combination with Luick taught the medium in claim 21, as shown above. Bose further teaches the computer-readable medium wherein initiating the power increase comprises: initiating (signaling via signal 134) the power increase for a functional unit selected
15 from a group of functional units that includes one or more floating-point units, multipliers, dividers, shifters, digital signal processors, co-processors, application specific integrated circuits, data processing engines, debug logic blocks, encryption units and key-generation units (paragraph 37).

As to claim 26, Bose discloses an apparatus comprising: one or more functional units
20 (execution units 118, 120, 122); an instruction cache (Bose discloses "an instruction cache (ICACHE) 102, an instruction fetch address register (IFAR) 104, an instruction buffer (IBUF) 106, multiplexor 108, branch history table and branch target buffer logic BHT/BTB 110, a

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branch unit 112, an instruction decode-dispatch unit IDU 114 and an issue queue 116 form a typical instruction unit (I-Unit)” wherein said instruction cache is the “instruction unit” and hereinafter referred to as “IUNIT”; paragraph 37); a processing engine (130), which is operable to access software instructions stored within the instruction cache (IUNIT), and send one or more
5 special instructions to the one or more functional units in order to execute at least some of the software instructions (Bose discloses machine instructions being fetched from the instruction cache of IUNIT but said instructions are inherently fetched from system memory into the instruction cache of a processor and essentially made accessible to a processing engine 130 for prediction/evaluation for power management; paragraph 39, lines 1-24); an activity prediction
10 logic (130) that is configured to evaluate selected ones of the software instructions, and to determine which functional units will be needed to execute an instruction (paragraph 42); and, one or more power controllers (150 within 130), which are operable to control (send “sleep,” “power-down,” or “wake up” signals via 134) whether or not an operable power level or a low power level is provided to selected ones of the one or more functional units (paragraphs 40 and
15 42), based on whether or not selected ones of the one or more functional units are operable to execute at least one software instruction stored within the instruction cache (paragraph 37, lines 20-28 and paragraph 40, line 1 thru paragraph 41, line 5).

Bose fails to explicitly disclose the information vector being generated *before or as the line is fetched into the instruction cache*.

20 Luick teaches a processor power management system and method wherein instructions are evaluated in a predecoder (115) before fetching instructions into an instruction cache (130) (column 2, lines 18-26 and column 4, line 57 thru column 5, line 26). Luick teaches the added

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benefit of having additional features that would further conserve power to the system (column 1, lines 63-67).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose and Luick at the time the invention was made, to modify method of Bose to include
5 evaluating the instructions before or as the before or as the line is fetched into the instruction cache as taught by Luick. One of ordinary skill in the art would be motivated to make this combination to evaluate the instructions and generate the instruction vector before or as the line is fetched into the instruction cache in view of the teachings of Luick, as doing so would give the added benefit of having additional features that would further conserve power to the system (as
10 taught by Luick above).

As to claim 27, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus wherein at least one of the one or more functional units includes an internal functional unit, which is located on a same chip as the processing engine (Bose discloses the processor being a pipelined processor such that the
15 functional units will contain multiple stage units for processing; paragraphs 37 and 62).

As to claim 28, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus wherein at least one of the one or more functional units includes an external functional unit, which is not located on a same chip as the processing engine (Any other unit used for processing not found within the processing engine
20 130; paragraph 37).

As to claim 29, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus wherein the instruction cache includes a conventional cache (paragraph 37).

5 As to claim 30, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus wherein the instruction cache includes a trace cache (paragraphs 37 and 39).

As to claim 35, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus further comprising: a battery interface, operable to provide power to the one or more functional units (paragraph 6).

10 As to claim 36, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus further comprising: a wireless medium interface, operable to enable signals to be sent to and received over a wireless medium (Bose discloses laptops, portable and mobile systems that commonly have wireless medium interfaces; paragraph 6).

15 As to claim 37, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus further comprising: a network interface, operable to enable signals to be sent to and received from a network (Bose discloses laptops, portable and mobile systems that commonly have network interfaces; paragraph 6).

20 As to claim 38, Bose in combination with Luick taught the apparatus in claim 26, as shown above. Bose further teaches the apparatus wherein the one or more functional units comprise: one or more functional units selected from a group of functional units that includes one or more floating-point units, multipliers, dividers, shifters, digital signal processors, co-

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processors, application specific integrated circuits, data processing engines, debug logic blocks, encryption units and key-generation units (paragraph 37).

Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bose in
5 view of Luick as applied to claim 26 above, and further in view of Theis (U.S. Patent Publication No. 2005/0251621 A1) (hereinafter referred to as Theis).

As to claim 31, Bose discloses an instruction cache (IUNIT) with an array (branch history table within 110) but fails to disclose the instruction cache comprising: the array having storage locations; and, a mechanism to sequentially access the storage locations within the array using an
10 enable signal, which has a value that results from shifting information within one or more shift registers.

Theis teaches a cache (heap-address cache) that contains an array (stack) of storage locations (addresses) that sequentially accesses (circular stack which sequentially accesses said addresses) using an enable signal (stack pointer or symbolic variable; paragraph 81) that accesses
15 the stack which has a value (count) that results from shifting within one or more shift registers (paragraph 218). Theis also has the added benefit of accessing addresses using both conventional machine code as high level programming languages (paragraphs 78-81).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose, Luick and Theis at the time the invention was made, to modify the instruction cache
20 (IUNIT) of Bose to include the ability to store and access an array (stack) of addresses sequentially by use of shift registers as taught by Theis. One of ordinary skill in the art would be motivated to make this combination of having an instruction cache that can store and access an

array (stack) of addresses sequentially by use of shift registers in view of the teachings of Theis, as doing so would give the added benefit of accessing addresses using both conventional machine code as high level programming languages (as taught by Theis above).

As to claim 32, Bose in combination with Luick and Theis taught the apparatus in claim 5 31, as shown above. Theis further teaches the apparatus wherein the mechanism to sequentially access the storage locations includes a plurality of first latches, within which a first portion of the enable signal is stored, and wherein the first portion of the enable signal is used to activate a selected word line within the array (Theis teaches the stack of addresses being sequentially accessed by use of a stack pointer which uses a latch [multiplexor] to select the stack item; 10 paragraph 218).

As to claim 33, Bose in combination with Luick and Theis taught the apparatus in claim 32, as shown above. Theis further teaches the apparatus wherein the mechanism to sequentially access the storage locations includes a plurality of second latches, within which a second portion of the enable signal is stored, wherein the second portion of the enable signal is used to select a 15 portion of the selected word line (Theis teaches the stack of addresses being sequentially accessed by use of a stack pointer which uses a latch [multiplexor] to select the stack item; paragraph 218).

Claims 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bose (as 20 cited above) in view of Luick (as cited above) and further in view of Theis (also cited above).

As to claim 39, Bose discloses an apparatus comprising: one or more functional units (execution units 118, 120, 122); an instruction cache (Bose discloses "an instruction cache

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(ICACHE) 102, an instruction fetch address register (IFAR) 104, an instruction buffer (IBUF) 106, multiplexor 108, branch history table and branch target buffer logic BHT/BTB 110, a branch unit 112, an instruction decode-dispatch unit IDU 114 and an issue queue 116 form a typical instruction unit (I-Unit)” wherein said instruction cache is the “instruction unit” and
5 hereinafter referred to as “IUNIT”; paragraph 37); a processing engine (130), which is operable to access software instructions stored within the instruction cache (IUNIT), identify at least one functional unit from the one or more functional units based on a determination of whether the one or more functional units is operable to execute at least one software instruction stored within an instruction cache (with request signals 134; paragraph 40), and send one or more special
10 instructions to the at least one or more functional unit in order to execute at least one of the software instructions (Bose discloses machine instructions being fetched from the instruction cache of IUNIT but said instructions are inherently fetched from system memory into the instruction cache of a processor and essentially made accessible to a processing engine 130 for prediction/evaluation for power management; paragraph 39, lines 1-24); an activity prediction
15 logic (130) that is configured to evaluate software instructions, and to determine which functional units will be needed to execute an instruction (paragraph 42).

Bose fails to explicitly disclose the information vector being generated *before or as the line is fetched into the instruction cache*.

Luick teaches a processor power management system and method wherein instructions
20 are evaluated in a predecoder (115) before fetching instructions into an instruction cache (130) (column 2, lines 18-26 and column 4, line 57 thru column 5, line 26). Luick teaches the added

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benefit of having additional features that would further conserve power to the system (column 1, lines 63-67).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose and Luick at the time the invention was made, to modify method of Bose to include evaluating the instructions before or as the before or as the line is fetched into the instruction cache as taught by Luick. One of ordinary skill in the art would be motivated to make this combination to evaluate the instructions and generate the instruction vector before or as the line is fetched into the instruction cache in view of the teachings of Luick, as doing so would give the added benefit of having additional features that would further conserve power to the system (as taught by Luick above).

This teaches a cache (heap-address cache) that contains an array (stack) of storage locations (addresses) that sequentially accesses (circular stack which sequentially accesses said addresses) using an enable signal (stack pointer or symbolic variable; paragraph 81) that accesses the stack which has a value (count) that results from shifting within one or more shift registers (paragraph 218). This also has the added benefit of accessing addresses using both conventional machine code as high level programming languages (paragraphs 78-81).

It would have been obvious to one of ordinary skill of the art having the teachings of Bose and This at the time the invention was made, to modify the instruction cache (IUNIT) of Bose to include the ability to store and access an array (stack) of addresses sequentially by use of shift registers as taught by This. One of ordinary skill in the art would be motivated to make this combination of having an instruction cache that can store and access an array (stack) of addresses sequentially by use of shift registers in view of the teachings of This, as doing so

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would give the added benefit of accessing addresses using both conventional machine code as high level programming languages (as taught by Theis above).

As to claim 40, Bose in combination with Luick and Theis taught the apparatus in claim 39, as shown above. Theis further teaches the apparatus wherein the mechanism to sequentially
5 access the storage locations includes a plurality of first latches (registers), within which a first portion (entry x) of the enable signal is stored, and wherein the first portion of the enable signal is used to activate a selected word line within the array (Theis teaches the stack of addresses being sequentially accessed by use of a stack pointer which uses a latch [register] to select the stack item; paragraph 218).

10 As to claim 41, Bose in combination with Luick and Theis taught the apparatus in claim 40, as shown above. Theis further teaches the apparatus wherein the mechanism to sequentially access the storage locations includes a plurality of second latches (registers), within which a second portion (entry y) of the enable signal is stored, wherein the second portion of the enable signal is used to select a portion of the selected word line (Theis teaches the stack of addresses
15 being sequentially accessed by use of a stack pointer which uses a latch [register] to select the stack item; paragraph 218).

As to claim 42, Bose in combination with Luick and Theis taught the apparatus in claim 39, as shown above. Theis further teaches the apparatus further comprising: one or more power controllers (150 within 130), which are operable to control (send “sleep,” “power-down,” or
20 “wake up” signals via 134) whether or not an operable power level or a low power level is provided to selected ones of the one or more functional units (paragraphs 40 and 42), based on whether or not selected ones of the one or more functional units are operable to execute at least

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one software instruction stored within the instruction cache (paragraph 37, lines 20-28 and paragraph 40, line 1 thru paragraph 41, line 5).

Response to Arguments

- 5 Applicant's arguments, see REMARKS, filed August 15, 2007, with respect to the rejection(s) of claim(s) 1, 15, 21 and 26 under 35 USC § 102(e) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made under 35 U.S.C. 103(a) as being unpatentable over Bose in view of Luick.
- 10 Applicant's arguments, see REMARKS, filed August 15, 2007, with respect to the rejection(s) of claim(s) 39 under 35 USC § 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made under 35 U.S.C. 103(a) as being unpatentable over Bose in view of Luick and in further view of Luick.
- 15

Conclusion

- Examiner has cited particular columns and line numbers in the references as applied to the claims above for the convenience of the Applicant. Although the specified citations are representative of the teachings of the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from
- 20 the Applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by

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the prior art or disclosed by the Examiner. Also, any prior art made of record and not relied upon is also considered pertinent to Applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to James Sugent whose telephone number is (571) 272-5726. The

5 Examiner can normally be reached on 8AM - 4PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Rehana Perveen can be reached on (571) 272-3676. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent
10 Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at (866) 217-9197 (toll-free). If you would
15 like assistance from a USPTO Customer Service Representative or access to the automated information system, call (800) 786-9199 (IN USA OR CANADA) or (571) 272-1000.

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20 October 27, 2007


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10/29/07